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Federal Grain Inspection Service  
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WEIGHING HANDBOOK  
Chapter 4  
3-13-89

## CHAPTER 4

### CHECKWEIGHING

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4.1  
INTRODUCTION

Checkweighing is a service provided under the United States Grain Standards Act, as amended (USGSA), or the Agricultural Marketing Act of 1946 (AMA). Official personnel weigh a specified number of commodity-filled containers taken from a lot of grain, rice, or other commodity and determine the estimated total gross, tare, and net weight of the lot or the estimated average gross or net weight of each container.

4.2  
DEFINITIONS

1. Agency. Any State or official agency or any person designated by the Administrator to conduct official inspection and/or Class X or Class Y weighing services.
2. Average Gross Weight. The average weight of one unit of the commodity including the container(s).
3. Average Net Weight. The average weight of one unit of the commodity excluding the container(s).
4. Average Tare Weight. The average weight of one empty container or containers if the commodity is packaged as several primary containers within a secondary container.
5. Commodity. Any grain, rice, hops, pulses, or processed product inspected or weighed by the Federal Grain Inspection Service (FGIS) under the USGSA or AMA.
6. Container. An empty bag, package, box, sack, or receptacle used to hold a commodity.
7. Cooperator. A Federal agency that has an interagency agreement with FGIS or a State agency that has a reimbursable agreement with FGIS.
8. Estimated Total Gross Weight. The estimated weight of the entire lot including the weight of the containers.
9. Estimated Total Net Weight. The estimated weight of the entire lot excluding the weight of the containers.
10. Estimated Total Tare Weight. The estimated weight of all the containers in an entire lot.
11. Gross Product Target Weight. The expected weight of one unit of the commodity including the container(s).
12. Lot. An identified quantity of commodity.

13. Maximum Allowable Variance (MAV). A value that limits negative deviations in individual unit weights to a specified range.

14. Scale. An FGIS or National Institute of Standards and Technology (NIST)-approved device used to weigh commodities and containers.

15. Scale Division. The smallest indicated value on a beam scale or the difference between two consecutively indicated or printed values on a digital scale.

16. Sublot. A predetermined portion of an overall lot.

17. Test Weight. An NIST-Class F weight that has been tested and certified by a State Weights and Measures metrology laboratory or FGIS and is used to verify the accuracy of scales.

18. Unit. A filled container (or containers if the commodity is packaged in several primary containers within a secondary container).

#### 4.3 REQUIREMENTS FOR SERVICE

A. Work Area. The applicant must provide adequate work space including a suitable table or bench on which to place the scale.

B. Accessibility. The applicant must make all units of the lot accessible.

1. For Grain. If the lot cannot be made fully accessible, dismiss the service.

2. For All Other Commodities. If the lot cannot be made fully accessible, issue a "partial inspection" certificate.

C. Movement of Selected Units.

1. When the scale cannot be located in the same area as the units to be weighed, the applicant must provide transportation and labor to move selected units from the production-line or storage area to the scale.

2. Official personnel are responsible for lifting units weighing 25 kilograms (55 pounds) net or less from the production-line or pallet to the scale. The applicant may provide all or any part of this labor but is not required to do so.

3. The applicant is responsible for lifting units weighing more than 25 kilograms (55 pounds) net from the production-line or pallet to the scale. Official personnel may provide all or any part of this labor but are not required to do so.

D. Scales.

1. The applicant shall furnish scales for checkweighing sacked grain lots and for checkweighing other commodities when the unit size exceeds 50-kilograms. The applicant may also furnish scales for weighing commodities that weigh 50-kilograms or less but is not required to do so.

2. Official personnel shall furnish scales for checkweighing all sacked commodity lots, other than grain, provided the unit size is less than or equal to 50-kilograms.

4.4  
SCALE  
SPECIFICATIONS  
AND TESTS

A. Specifications.

1. FGIS/NIST Approval. Scales used for checkweighing must be approved by FGIS or NIST.

2. Maximum Allowable Division Sizes. Scales used for checkweighing must have the proper division size for the product being weighed. Table 1 (page 4-4) provides the maximum allowable division sizes for various gross product target weight ranges. For example, if the gross product target weight is 110 pounds, then the scale must have a division size no larger than 0.1 pound.

3. Special Contract Requirements. If the contract specifies a maximum allowable variance (MAV) for the product, then the smallest division on the scale shall not exceed half the MAV. For example, if a contract specifies an MAV of -.1 pound, the scale division shall not exceed 0.05 pound.

**TABLE 1**  
**DIVISION SIZE SELECTION**

Gross Product Target Weight Range		Maximum Allowable Division Size			
Pounds		Lbs.	Kgs.	Ozs.	Gms.
	.5 or less	-	-	-	<del>0.5</del> <del>0.05</del>
>	.5 < 2	-	-	1/16	1
>	2 < 5	-	-	1/8	2
>	5 < 10	.01	-	1/4	5
>	10 < 35	.02	.01	1/2	10
>	35 < 45	.05	.02	1	20
>	45 < 120	.1	.05	2	50
>	120 < 200	.2	.1	4	100
>	200 < 500	.5	.2	8	200
> = greater than					
< = less than or equal to					

**B. Semiannual Tests.**

1. Test scales at least twice a year (approximately every 6 months) according to the procedures in chapter 3 of this handbook.

a. FGIS-owned scales shall be tested by authorized FGIS personnel.

b. Industry-owned scales shall be tested by a State weights and measures agency, State-approved scale testing service, or authorized FGIS personnel.

2. Attach an approval sticker with the latest test date and the name of certifying official to each approved scale.

3. Scales found to be incapable of maintaining accuracy over a 6-month period should be tested more frequently to ensure accuracy or removed from service.

4. Maintain scale test records as specified in chapter 3.

**NOTE:** For automatic sacking scales, contact the Weighing & Equipment Branch, Field Management Division, for applicable specifications and test procedures.

### C. Daily Checks.

#### 1. Frequency. Balance and check the scales:

a. At the beginning of each work shift and at least one other time during each work shift,

b. Each time the scale is moved to a new location, and

c. When the scale is left unattended and the results or balance is questionable.

#### 2. Procedures.

##### a. Setting Zero.

(1) Mechanical Scales. Move all poises to zero and adjust the balance so that the beam swings an equal distance above and below the center mark on the indicator or the center of the trig loop.

(2) Digital Scales. Adjust the zero adjustment until the scale indication is a stable zero.

##### b. Sensitivity at Zero.

(1) Mechanical Scales. Balance the beam at zero. Move the poise two scale divisions. The beam should move to the bottom of the trig loop or balance indicator. If it does not, do not use the scale.

NOTE: For FGIS-owned, unmarked (manufactured prior to January 1, 1986) mechanical scales that have a capacity equal to or greater than 100 pounds, balance the scale at zero and then move the poise to .2 pound. The beam should move to the bottom of the trig loop or balance indicator. If it does not, do not use the scale.

(2) Digital Scales. Place a test weight(s) equal to two scale divisions in the center of the platform. The digital display should read one or two scale divisions above zero. If it does not, do not use the scale.

c. Strain Test.

(1) Mechanical Scales. Balance the beam at zero and lock the beam. Place a test weight(s) that is approximately equal to the weight of the commodity to be weighed in the center of the platform. Move the poise(s) to the value of the weight and unlock the beam. Use the poises to balance the beam so the beam moves an equal distance up and down. Read the weight from the beam. If the scale indication for the test load applied is within tolerance (see chapter 3, section 3.4, M), the scale may be used.

NOTE: For FGIS-owned, unmarked (manufactured prior to January 1, 1986) mechanical scales that have a capacity equal to or greater than 100 pounds, the tolerance allowed is: .05 pound for test loads 0 - 50 pounds and .1 percent of the test load for all test loads over 50 pounds.

(2) Digital Scales. Set the indicator at zero and place a test weight(s) that is approximately equal to the weight of the commodity to be weighed in the center of the platform. Read the indicator and print the weight if applicable. Indications flashing between two divisions will be considered one-half a division. If the scale indication for the test load applied is within tolerance (see chapter 3, section 3.4, M), the scale may be used.

4.5  
TARE  
WEIGHT

A. General. Determine the average tare weight once for each contract, unless the containers are made by more than one manufacturer or a new shipment of containers is used for a portion of the contract.

B. Single-Container Units.

1. Determine the average tare weight by averaging the weight of at least 10 empty containers selected at random.

2. If the combined weight of 10 containers is less than the minimum weight for tare determination (see table 2, page 4-7), add empty containers to the scale until the total weight is equal to or greater than the minimum weight for tare determination.

3. Divide the total weight of the containers by the total number of containers weighed to determine the average tare weight of one empty container.



TABLE 2  
TARE WEIGHT REQUIREMENTS

Scale Division Size			Minimum Weight for Tare Determination		
Lbs.	Ozs.	Gms.	Lbs.	Ozs.	Gms.
-	-	.05	-	-	2.5
-	1/16	1	-	3	50
-	1/8	2	-	6	100
.01	1/4	5	.5	12	250
.02	1/2	10	1.0	25	500
.05	1	20	2.5	50	1,000
.1	2	50	5.0	100	2,500
.2	4	100	10.0	200	5,000
.5	8	200	25.0	400	10,000

C. Multiple-Container Units.

1. Determine the average tare weight by averaging the weight of at least 10 empty primary (inner) containers selected at random and by averaging the weight of at least 10 empty secondary (outer) containers selected at random.

2. If, for either the primary or secondary containers, the combined weight of 10 containers is less than the minimum weight for tare determination (see table 2), add empty containers to the scale until the total weight is equal to or greater than the minimum weight for tare determination.

3. Divide the total weight of the primary containers by the total number of primary containers weighed to determine the average tare weight of one empty primary container.

4. Divide the total weight of the secondary containers by the total number of secondary containers weighed to determine the average tare weight of one empty secondary container.

5. Multiply the average tare weight of one empty primary container by the number of primary containers in one unit. Add this total to the average tare weight of one empty secondary container to determine the average tare weight of one unit.

D. Very Light Containers.

1. If a large number of containers are needed to determine the tare weight, use a scale with a small scale division to weigh the containers.

2. Determine the average tare weight of stretch-wrap and shrink-wrap plastic balers (secondary containers) once for each shipment of the baler material.

E. Warehouse Lots.

1. If empty containers are not available for determining tare weight and the lot was previously checkweighed (e.g., at origin), use the previously determined tare weight.

2. If empty containers are not available for determining tare weight and the lot is not known to have been previously checkweighed, use the following table to determine the tare weight.

TABLE 3  
SPECIAL TARE WEIGHTS

Type of Sack	Net Weight	Tare Weight
Single polypropylene	100 lbs net	0.25 pound
Single polypropylene	50 kgs net	0.27 pound
Single burlap	100 lbs net	0.70 pound
Single burlap	50 kgs net	0.75 pound
Double burlap	100 lbs net	1.20 pound
Double burlap	50 kgs net	1.40 pound

4.6

SAMPLE  
SIZE AND  
SELECTION  
METHODS

A. Sample Size.

1. Checkweigh no less than the minimum number of units required per subplot 1/ or lot. See table 4, page 4-9.

2. Checkweigh additional units if sample manipulation or gross packing inconsistency is suspected.

1/ Applicable to rice and grain checkweighed online (re: Chapter 8, "Roundlot Inspection", Rice Inspection Handbook, and FGIS Instruction 918-41, "Sacked Grain").

3. When one lot consists of two different types of sacks (for example, polypropylene and burlap) with the same net weight, weigh the lot as two separate lots by type of sack and complete a worksheet for each. Use table 4 to determine the number of sacks of each type to weigh. Upon request, certificate the lots on one certificate.

4. If a contract or agreement specifies that a greater number of units be checkweighed than is specified in table 4 (e.g., Defense Personnel Support Center (DPSC) contracts), the sample size shall be as specified by the contract or agreement.

**TABLE 4**  
**SAMPLE SIZE**

Number of Units in Sublot or Lot	Minimum Number of Units Checkweighed
0 - 1500	12
1501 - 3000	20
3001 - over	36

**B. Selection Methods.** When units are selected off the production line, use either the time method, the portion method, the random numbers method, or any other comparable method. In all other situations, use the random numbers method.

**1. Time Method.**

a. Determine the normal number of hours or minutes it takes to pack the lot or subplot.

b. Determine the sample size.

c. Divide the number of hours or minutes it takes to pack the lot or subplot by the sample size.

d. Randomly select a unit(s) 1/ at approximately the specified interval. Do not set a pattern of selecting units at any one particular time (e.g., every 15 minutes). If more than one line is operating, alternate selecting units between lines.

Example: The applicant is sacking a subplot of 8,100 50-kilogram sacks of corn over an 8-hour shift. The sample size is 36 sacks.

$8 \text{ (hours required to pack the lot)} \div 36 \text{ (sample size)} = .22 \text{ hours per sack} = 13 \text{ minutes per sack}$

Therefore, checkweigh 1 unit during every 13-minute interval.

## 2. Portion Method.

a. Determine the sample size (see table 4).

b. Divide the number of units in the lot or subplot by the sample size.

c. Randomly select a unit(s) 1/ at the specified interval; e.g., checkweigh 1 unit for every 100 units that are packed. Do not set a pattern of selecting units at a preset frequency. If more than one line is operating, alternate selecting units between lines.

## 3. Random Numbers Method.

a. Determine the sample size (see table 4).

b. Use the attached random numbers table (attachment 2) to determine which units to select.

NOTE: A random number may (1) designate the number of the selected unit or (2) designate the pallet from which a unit will be selected. When a random number is used to designate the number of the pallet from which a unit is selected, official personnel should randomly select one unit from the pallet.

1/ When a dual-scale, double-sided packer is used (e.g., a packer that alternately weighs and fills pairs of containers), weigh matched pairs of filled containers.

(1) Determine the starting point in the random numbers table. When the table is used for the first time, the starting point will be the upper left-hand block of numbers on the first page. When using the table on subsequent occasions, the starting point will be the row of numbers immediately following the last row of numbers used.

(2) Begin at the left of the first row of numbers used. Combine as many consecutive digits in the number as needed to coincide with the number of containers in the subplot or lot. For example, for lot sizes of 10 to 99, combine 2 digits to form a single number; for lot sizes of 100 to 999, combine 3 digits to form a single number; etc.

(3) Proceed reading digits from the starting point to the bottom of the page. When the end of a column is reached, continue to the top of the next column to the right. When the end of a page is reached, proceed to the beginning of the next page. When the end of the last page is reached, go back to the first page.

(4) Discard groups of consecutive digits that are larger than the subplot or lot size and continue to the next row of digits.

(5) Discard groups of consecutive digits that are repeated.

(6) Record the usable groups of consecutive digits until the appropriate number of groups have been identified.

(7) List the numbers in numerical order on the worksheet.

c. Determine which units or pallets comprise each subplot or lot.

d. Select the units or pallets that correspond to each random number.

NOTE: If the commodity is packaged in containers within containers, such as polyethylene packages inside paper bales, obtain the random sample by selecting an equal number of the outer containers from each portion and weigh the outer containers together with their contents.

4.7  
WEIGHING  
AND  
CERTIFICATION

A. Weighing Procedures. Obtain the proper number of units (see table 4) from the production line or pallets, as applicable, using the proper selection method.

1. Select and weigh units that are representative of the lot. Do not weigh torn or leaking units.

2. Weigh selected units individually or in convenient multiples.

3. Record the results of each weighing and the number of units in each weighing, when weighed in multiples, on the worksheet (Form FGIS-991, "General Services Worksheet," for rice, pulses, and grain; or a Form FGIS-992, "Services Performed Report," for processed products). See Example Worksheet - attachment 1.

4. Record the results of each weighing on the worksheet to the smallest division size of the scale.

B. Weight Information. Compute the results and record your findings on the appropriate worksheet. See Example Worksheet - attachment 1.

1. Average Gross Weight. Add the gross weights of all the units weighed, then divide the total by the number of units weighed. Round the result to the nearest hundredth unit.

2. Average Tare Weight. Add the weights of all the containers weighed, then divide the total by the number of containers weighed. Round the result to the nearest hundredth unit.

3. Average Net Weight. Subtract the average tare weight from the average gross weight. Round the result to the nearest hundredth unit.

4. Estimated Total Gross Weight. Multiply the average gross weight by the total number of units in the lot. Round the result to the nearest kilogram or pound.

5. Estimated Total Tare Weight. Multiply the average individual tare weight by the total number of units in the lot. Round the result to the nearest kilogram or pound.

6. Estimated Total Net Weight. Subtract the estimated total tare weight from the estimated total gross weight. Round the result to the nearest kilogram or pound.

C. Certification.

1. Issue a certificate according to the procedures in the applicable handbook for each lot checkweighed.

2. Show the following information, as applicable, on each certificate.

a. The identification of the sublots or lot and, when applicable, the seal numbers.

b. The date(s) packing of the sublots or lot was completed.

c. The number of units in the subplot(s) or lot.

d. A description of the bag markings.

e. The estimated or average total gross, tare, and net weight of the lot.

f. Other related information.

EXAMPLE WORKSHEET

GENERAL SERVICE WORKSHEET				LOCAL-FORE	FIELD OFFICE	PAGE																																																																																								
Provides data for verification of quantity, quality, and condition of export				Houston, Texas		1-1																																																																																								
NAME AND ADDRESS OF APPLICANT				LOCATION OF COMMODITY																																																																																										
Johnson Rice Mill, Inc. Houston, Texas 77004				Same																																																																																										
COMMODITY				TYPE OF MOVEMENT																																																																																										
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B-23				RLSR		RLSR																																																																																								
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Clean				Max Edison																																																																																										
COMMODITY PLACED WITH				FORM F005-001 (7-88)																																																																																										
Phostoxin				(Continued Form F005-001 (5-87) and 100-25 (4-79) use for 100-25)																																																																																										



TABLE OF RANDOM NUMBERS

659156	034646	346480	021038	340229	043907
339770	290314	143688	354422	900012	760590
652044	207095	373834	997281	115078	716662
611444	708280	866070	910648	695118	311367
110968	687516	391094	909960	262444	487474
111915	611507	425447	157400	225774	071486
851530	207095	373874	273439	996536	285019
150568	170875	487757	747819	743117	739804
726277	473839	596930	070539	269265	087977
679120	812174	290054	354988	912359	585474
464872	557335	476317	352911	484005	870949
602112	587987	300584	911185	863961	639395
376150	263426	207152	738668	948411	254414
735632	150005	142274	916354	600718	271947
204354	125854	528863	356264	688128	824011
000557	528178	182821	692693	542295	218048
009409	933180	318040	953374	463100	480121
114919	339542	291124	607111	204584	766318
379602	660350	780628	137970	047943	750622
330422	991713	422284	015147	165306	117489
220588	848405	171778	476792	584954	356754
049989	553212	449279	742879	661439	460088
379700	467808	707323	800869	835471	312729
155939	224928	453673	188840	555956	220729
017807	706164	665123	987776	781819	761225
553427	184457	358926	524470	916395	509820
016168	755051	384587	972765	925887	862768
851524	731371	833053	605497	554063	549270
204917	784068	641878	280888	435342	674021
151493	056222	565821	087277	204956	931346
908728	911726	857092	611042	937856	351455
041776	466190	129324	676840	527197	292262
138039	814858	759662	383733	662609	799617
329071	664128	606642	727344	749813	895958
406473	439998	032398	388978	664972	340645
548321	849909	676377	810241	355630	050915
378866	900340	555925	313041	588990	600555
018893	130783	725123	705134	318525	547001
452251	373431	195667	644061	268222	877293
362662	330379	930324	275971	766010	862085

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626364	197638	657972	864978	231215	947098
183701	199838	409792	333233	821235	724195
89046	655418	469721	977730	467257	231289
119041	550088	999560	219654	005876	005876
517543	386505	575827	963159	918977	304469
661366	343519	595822	856819	196561	968089
713933	714842	082929	595429	587982	069876
006847	669360	778282	665204	373982	205768
117765	906701	425055	010152	471312	479957
136075	775006	882310	900136	808662	029405
314872	503938	557383	209444	005589	652115
619896	875875	902471	456209	867789	111985
024860	226692	617250	234214	665892	523446
982363	025912	624434	913875	645892	523443
031763	601487	607081	055478	938287	603723
312603	487608	508546	696647	750773	803659
910928	632377	687231	699795	593444	254968
708789	468824	505992	089389	844746	641044
977532	858191	837708	528063	651814	493198
154913	000563	361080	840178	474332	782525
712659	006378	146925	689428	695586	981411
974906	082998	126328	656166	237092	098055
815580	373563	282399	521379	864980	783019
406945	320181	469445	085552	888670	856524
024917	961097	295247	724030	569060	701093
479160	840407	238605	698412	758672	429641
366848	524205	121358	296023	746741	658875
718939	753183	857051	023170	970834	529912
172506	823446	420751	945808	095292	788706
147017	197887	676053	407507	317664	523339
758053	896357	123844	178871	061284	126141
055691	907814	127083	224626	064547	118183
886394	285272	564562	259292	050288	516333
198537	119943	099727	626665	313260	956242
909340	461582	268809	564682	660389	495991
734114	695511	711673	934654	741440	577086
837743	347749	329985	779050	580398	953156
192991	714852	382392	331828	514719	396086
678301	169027	348318	966446	349957	219455
510366	268175	916299	129340	623209	972180
576601	153946	531371	193021	153068	862977

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531854	201051	624313	197608	507127	687524
313452	847637	433267	029847	306942	433778
935693	246704	072701	314715	990109	599242
220263	923131	103841	501740	033904	448129
182199	559087	473263	437440	993213	804412
020073	367236	278179	623975	641953	274844
388061	458061	335694	334583	677684	562455
523659	223003	751716	479298	967099	218435
185725	294664	139472	905566	836680	541922
443459	084450	029116	478545	529271	578744
803529	612472	648763	320273	888245	578715
268571	269342	332049	404283	530621	023923
590482	091185	559806	328155	873070	073638
162143	877403	715811	024770	713007	370581
770488	104891	512963	815067	173726	059667

# Issuance Change

CHANGE TO

☐ DIRECTIVE

☐ MANUAL

☒ HANDBOOK

CHANGE NO.	TO (No.)	TITLE	DATE
16		Chapter 4, "Checkweighing," to the Weighing Handbook	3-13-89

PURPOSE OF CHANGE

This transmits a new chapter to the Weighing Handbook which consolidates all checkweighing procedures into one directive. This chapter establishes the policies and procedures for checkweighing grain, rice, pulses, and processed commodities.

FILING INSTRUCTIONS

Insert the new chapter in the Weighing Handbook and the new table of contents.

Remove Chapter 2, "Checkweighing," Miscellaneous Processed Commodities Handbook (MPCH), and  
Chapter 13, "Checkweighing," Rice Handbook.

Line-through Section VII, "Weighing Grain After Sacking," in FGIS Instruction 918-41, "Sacked Grain."

Section 10.13, "Checkweighing," Rice Handbook.

Section 5.3B, "Weighing," MPCH.

Section 7.06, "Checkweighing," MPCH.

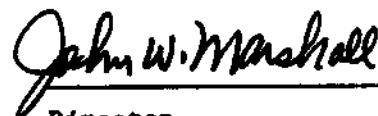
Section 7.13, "Checkweighing Containers," MPCH.

Section 8.01, "Sampling Rate," MPCH (as it applies to checkweighing only).

Section 8.04, "Checkweighing Procedures," MPCH.

Section 9.08, "Checkweighing," MPCH.

Section 13.3B, "Weighing," MPCH.



Director  
Field Management Division

Distribution: A, C, E, G, N

Originating Office: SPB, FM

February 2, 1993

TO: Phoebe Mikalaski  
Directives Management  
Resource Management Division

FROM: Richard R. Pforr, Chief ~~/s/ Richard R. Pforr~~  
Weighing and Equipment Branch

SUBJECT: Weighing Handbook Pen and Ink Change

In the next Quaterly Issuance Checklist, we would like to make a pen and ink change. In the Weighing Handbook, Chapter 4, page 4-4, dated 3-13-89, Division Size Selection Table 1, change the Maximum Allowable Division Size from .05 Gms. to 0.5 Gms. Please contact Martin Begley if you have any questions.